

REMARKS

This application has been reviewed in light of the Office Action dated April 23, 2003. Claims 1-15, 19-36, and 38-45 are presented for examination, with Claims 1-13 having been allowed, and Claims 22, 28, and 35 having been indicated as containing allowable subject matter. Claims 1, 14, 21, 34, 44, and 45 are in independent form. Claims 14, 19-21, 34, 35, 38, 39, 44, and 45 have been amended to define more clearly what Applicant regards as the invention. Claims 18 and 37 have been cancelled, without prejudice or disclaimer of the subject matter presented therein (because their subject matters are now recited in independent Claims 14 and 34, respectively). Favorable reconsideration is requested.

Claims 14, 15, 18-21, 23-27, 30-34, and 36-45 have been rejected under 35 U.S.C. § 102(e) as being anticipated by Kitamura et al. (U.S. Patent Application Publication No. 2002/0031972), and Claim 29 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kitamura et al. Claims 14, 15, 18-20, 40, 41, 44, and 45 have been rejected under Section 103(a) as being unpatentable over Lambe (U.S. Patent No. 4,728,851) in view of the article by Rodriguez et al., entitled "Catalytic Engineering of Carbon Nanostructures", Langmuir 1995, Vol. 11, No. 10, American Chemical Society (1995), pp. 3862-3866. Claims 21, 23, 25-27, 29-34, 36-39, 42, and 43 have been rejected under Section 103(a) as being unpatentable over Lambe in view of Deguchi et al. (U.S. Patent No. 6,400,091), and Claim 24 has been rejected under Section 103(a) as being unpatentable over Lambe and Deguchi in view of Rodriguez et al.

Cancellation of Claims 18 and 37 renders their rejection moot.

In regard to the rejection of Claims 14, 15, 19-21, 23-27, 29-34, 36, and 38-45 based on the Kitamura et al. reference, Applicant is in the process of preparing sworn English-language translations of the priority documents JP 2000/265819, filed September 1, 2000, and JP 2001/255145, filed August 24, 2001, which antedate the Kitamura et al. reference's August 29, 2001 filing date. Such translations will be submitted as soon as they are completed.¹ Since the priority documents antedate Kitamura et al., it is believed that Kitamura et al. does not qualify as a reference against the claims of the present application, and Applicant respectfully requests that the rejections based on Kitamura et al. be withdrawn.

In regard to the rejection of independent Claims 14, 44, and 45 as being unpatentable over Lambe in view of the article by Rodriguez et al., Applicant respectfully submits that these claims are patentable over these references for at least the following reasons.

Claim 14 requires an electron-emitting device including a cathode electrode and a gate electrode arranged at an interval on a surface of a first substrate, and a plurality of carbon fibers each of which contains carbon as a main ingredient, arranged on the cathode electrode and connected electrically to the cathode electrode. Each of the carbon fibers has a plurality of graphenes which are layered so as not to be parallel to an axis direction of the fiber.

A notable feature of Claim 14 is the plurality of carbon fibers electrically connected to the cathode electrode. Support for this feature can be found in the specification at least at page 18, lines 4-11, page 23, lines 9-22, and page 24, lines 16-25, in reference to Figures

^{1/} Certified copies of the priority documents were submitted with the Claim to Priority filed on November 29, 2001.

1A, 1B, 6, 11, and 12. This portion of the specification describes that an electron-emitting material 4 is provided on a cathode 3, and that the electron-emitting material 4 can be fibrous carbon. Page 24, lines 16-25 states that Figures 11 and 12 show an example of the configuration of fibrous carbon, which contains a plurality of fibers. (It is to be understood, of course, that the scope of Claim 14 is not limited to the details of this embodiment, which is referred to only for purposes of illustration.)

In rejecting Claim 14 based on the Lambe and Rodriguez et al. references, the Office Action states that Lambe discloses “fiber carbon on cathode electrode 16 . . .” (See paragraph 6 of the Office Action.) However, Lambe describes his device as including “a carbon filament cathode element 16,” not a plurality of carbon fibers electrically connected to, or on, a cathode electrode. (See column 2, lines 15-17.) Therefore, Applicant submits that the single carbon filament cathode element 16 of Lambe cannot disclose *both* a cathode electrode *and* a plurality of carbon fibers on the cathode electrode as recited in Claim 14. Indeed, nothing has been found, or pointed out in Lambe that would teach or suggest these features of Claim 14.

To supplement the disclosure of Lambe, the Office Action refers to the Rodriguez et al. article to allegedly disclose carbon fibers having “a plurality of graphenes layered so as not to be parallel to an axis direction of the fiber . . .” Even if Rodriguez et al. be deemed to disclose such a feature, Applicant submits that nothing in Rodriguez et al. would teach or suggest that which is not disclosed in Lambe, namely, a plurality of carbon fibers electrically connected to a cathode electrode, as required by Claim 14.

Since neither of these references is believed to teach or suggest the plurality of carbon fibers electrically connected to the cathode electrode, Claim 14 is believed to be patentable over Lambe and Rodriguez et al., whether considered separately or in combination.

Independent Claims 44 and 45 each include the feature of a plurality of carbon fibers electrically connected to a cathode electrode, as discussed above in connection with Claim 14, and are believed to be patentable over Lambe and Rodriguez for at least the same reasons.

In regard to the rejection of independent Claims 21 and 34 as being unpatentable over Lambe in view of Deguchi et al., Applicant respectfully submits that the combination of Lambe and Deguchi et al. is improper.

The Patent Office has the burden to establish a prima facie case of obviousness when combining references. There must be, inter alia, first a suggestion or motivation to combine the teachings, and second a reasonable expectation of success. See M.P.E.P. § 2143. As a motivation to modify Lambe by the alleged teachings of Deguchi et al., the Office Action proposes that such a modification would produce a large quantity of electrons. No discussion regarding a reasonable expectation of success of such a modification has been found in the Office Action.

Applicant respectfully submits that the evidence provided in the Office Action is insufficient to meet the Patent Office's burden of establishing a prima facie case of obviousness for at least the following reasons. First, Claims 21 and 34 both require that electrons be emitted from the plurality of carbon fibers on the first electrode. The device disclosed in Lambe, on the other hand, emits electrons from the tip 18 of the cathode 16. See column 2, lines

46-48. Applicant submits that there would have been no motivation to add a plurality of carbon fibers to the cathode 16 of Lambe to emit electrons from the carbon fibers since the disclosed function of Lambe is to instead emit electrons from the tip 18 (which is sharpened to a cross-section of about 2000 Angstroms) of the pointed cathode 16 (See e.g., column 2, lines 35-37 and 47-48). Therefore, even if Deguchi et al. be deemed to teach a plurality of carbon fibers on top of a cathode, it is believed that there would have been no sufficient motivation to modify Lambe by this teaching.

Further, even assuming *arguendo* if Lambe were attempted to be modified to include a plurality of carbon fibers on top of its cathode 16, such a combination may detrimentally affect the manner in which electrons, if any, would be emitted from the tip 18 of the cathode 16 in the device of Lambe. Moreover, it is not clear whether any electrons would be controllably emitted from the plural carbon fibers since in Lambe electron emission (from tip 18) depends on a voltage between the elements 14 and 16 (and across tip 18). Even if any such electrons were to be emitted from the carbon fibers, this seemingly would detrimentally affect the overall operation of the Lambe device since those electrons seemingly would be emitted without precise directional control from the plural carbon fibers. Therefore, the Office Action's proposed modification of Lambe seemingly would not have had a reasonable expectation of success and also apparently would render Lambe unsatisfactory for its intended purpose.

For these reasons, Applicant respectfully submits that a *prima facie* case of obviousness has not been made by the Office Action against Claims 21 and 34, and that the

proposed combination of Lambe and Deguchi et al. is improper. Accordingly, withdrawal of the Section 103(a) rejections of Claims 21 and 34 is respectfully requested.

Moreover, even if the combination of Lambe and Deguchi et al. be deemed proper, (which, in any event, is not admitted as being the case) at least Claim 21 also is believed to be patentable over these references for at least the following additional reasons.

Claim 21 requires an electron-emitting apparatus including a first electrode and a second electrode disposed on a surface of a substrate, first voltage application means, a plurality of fibers, a third electrode, and second voltage application means. The first voltage application means is for applying to the second electrode a potential higher than a potential applied to the first electrode. The plurality of fibers are disposed on the first electrode, the fibers containing carbon as a main constituent. The third electrode is disposed so as to face the substrate. Electrons emitted from the fibers reach the third electrode. The second voltage application means is for applying to the third electrode a potential higher than each of the potentials applied to the first and second electrodes. A surface region of the fibers is placed between a plane, which contains a surface of the second electrode and is substantially parallel to the surface of the substrate, and a plane which contains a surface of the third electrode and is substantially parallel to the surface of the substrate.

A notable feature of Claim 21 is that a surface region of the fibers is placed between a plane, which contains a surface of the second electrode and is substantially parallel to the surface of a substrate, and a plane which contains a surface of the third electrode and is substantially parallel to the surface of the substrate. Support for this feature can be found in the

specification at least at page 19, line 26, to page 20, line 7, in reference to Figure 6. This portion of the specification states that “a plane containing the surface of the electron-emitting member 4 and substantially parallel to the surface of the substrate 1 is placed between the anode 61 and a plane containing a portion of the surface of the gate electrode 2 and substantially parallel to the substrate surface” (As stated earlier, it is to be understood that the scope of Claim 21 is not limited to the details of this embodiment, which is referred to only for purposes of illustration.)

Applicant notes that, in rejecting Claim 21 based on Lambe and Deguchi et al., the Office Action does not address such a feature. The Office Action states that “Lambe does not explicitly [disclose] fibers containing carbon as [a] main constituent on [the] first electrode and parallel to a surface containing the third electrode.” (See paragraph 7 of the Office Action.) Although Applicant agrees that this statement is true, it is not what Claim 21 explicitly requires. Claim 21 requires that a surface region of the fibers disposed on the first electrode be between a plane, which contains a surface of the second electrode and is substantially parallel to the surface of a substrate, and a plane, which contains a surface of the third electrode and is substantially parallel to the surface of the substrate. In other words, the surface region of the fibers is at a higher position than the surface of the second electrode, but is at a lower position than the surface of the third electrode. Since, as discussed above, Lambe is understood not to disclose both an electrode and a plurality of fibers on the electrode, Lambe is also believed not to teach or suggest having a surface region of the fibers being between two planes in the manner as defined in Claim 21.

The Office Action also states that Deguchi et al. discloses carbon fibers on a “cathode” 12 and parallel to anode 13. See paragraph 7 of the Office Action. However, this too is not what is explicitly required by Claim 21. Claim 21 does not explicitly require that the surface region of the fibers be parallel to the second electrode, but instead requires explicitly that the surface region of the fibers disposed on the first electrode be between two planes, wherein the planes are parallel to the substrate. Further, even if Deguchi et al. be deemed to disclose carbon fibers on an electrode 12, Applicant submits that nothing in Deguchi et al. would teach or suggest that the surface region of fibers disposed on a first electrode are between two planes, in the manner as defined in Claim 21.

Since neither Lambe nor Deguchi et al. are believed to teach or suggest these features, Claim 21 is believed to be patentable over these references, whether considered separately or in combination.

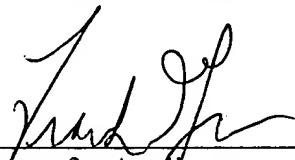
For all these reasons, withdrawal of the Section 103(a) rejections based on Lambe and Deguchi et al. is respectfully requested.

The other rejected claims in this application depend from one or another of the independent claims discussed above, and, therefore, are submitted to be patentable for at least the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, individual reconsideration of the patentability of each claim on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and the allowance of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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